



The Artemis Gateway as a Cislunar Science Platform

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Abstract

The Artemis Gateway is a lunar orbiting platform that will enable a sustainable human presence on and around the Moon beginning in this decade. Along with serving as a habitat for astronauts in support of lunar landing missions, Gateway provides a unique opportunity for science and research within cislunar space, from human health to space weather, with an eye toward deep space human space flight. Payloads are planned to be manifested on a rotating basis both internally and externally on the Gateway as well as on visiting Logistics Modules. Similar to the

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What is Gateway?



Image credit: NASA [[NASA's Plan for Sustained Exploration and Development](#)]

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Gateway Orbit

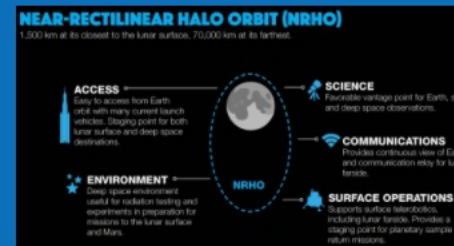


Image credit: NASA

The Near Rectilinear Halo Orbit was chosen

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Mission Timeline

Artemis Phase I -- Lunar Surface



Image credit: NASA

The overarching Artemis timeline is strategically envisioned in order to test

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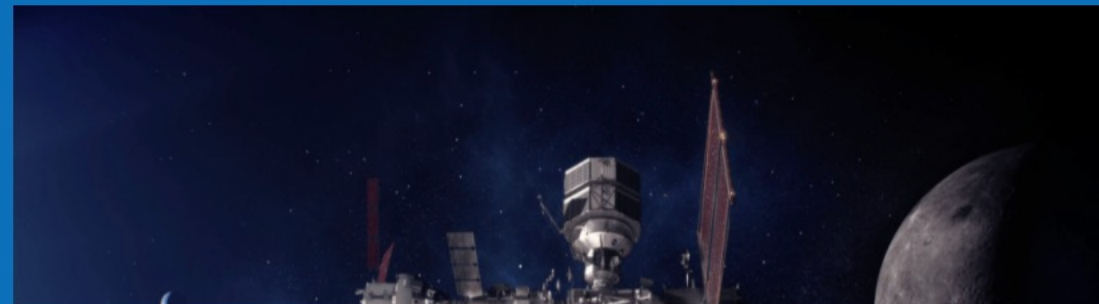
Gateway Utilization



Image credit: NASA Johnson

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Science in Cislunar Space



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Key Takeaways



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ABSTRACT

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Abstract

The Artemis Gateway is a lunar orbiting platform that will enable a sustainable human presence on and around the Moon beginning in this decade. Along with serving as a habitat for astronauts in support of lunar landing missions, Gateway provides a unique opportunity for science and research within cislunar space, from human health to space weather, with an eye toward deep space human space flight. Payloads are planned to be manifested on a rotating basis both internally and externally on the Gateway as well as on visiting Logistics Modules. Similar to the International Space Station, the Gateway benefits from significant international cooperation, and partnering agencies are collaborating to facilitate multilateral research across disciplines. We will present an overview of the Gateway mission and its unique capabilities and rich exploration space.

What is Gateway?

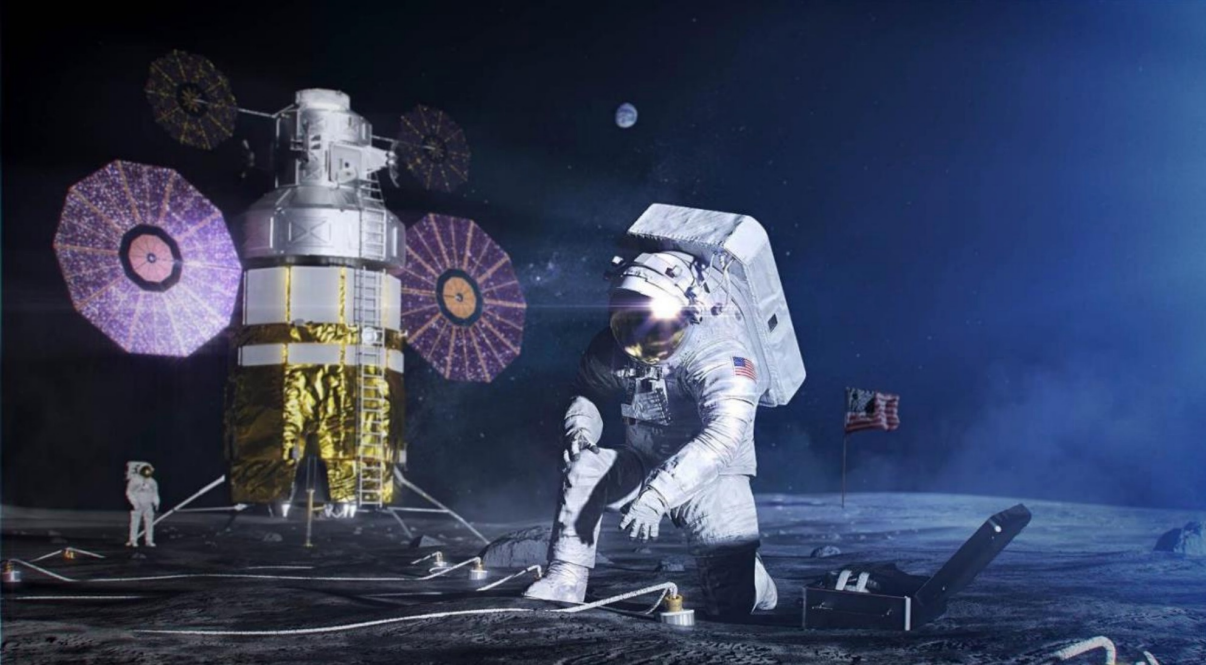


Image credit: NASA [[NASA's Plan for Sustained Exploration and Development](#)]

The Artemis program will lead a sustainable human presence on the lunar surface and enables a new era of exploration of the solar system by human missions. Gateway, a small orbiting space station around the moon, is a staging outpost for both phases of exploration - the lunar surface and beyond. The benefits of the Gateway include:

- Reduces the amount of fuel needed for individual lunar surface missions,
- Provides a docking point with resources for visiting vehicles,
- Maintains communication between lunar surface activities and Earth,
- Offers a temporary habitat for visiting astronauts,
- Enables science and Mars-forward technology development in a deep space environment.

Although significantly smaller than the International Space Station, Gateway also benefits significantly through international partnerships, primarily with the space agencies in Europe, Japan, and Canada. Unlike the ISS, Gateway will not be permanently crewed.

Gateway will consist of a Power and Propulsion Element (PPE), a Habitation and Logistics Outpost (HALO), and an International-Habitat (I-Hab).

Gateway Orbit

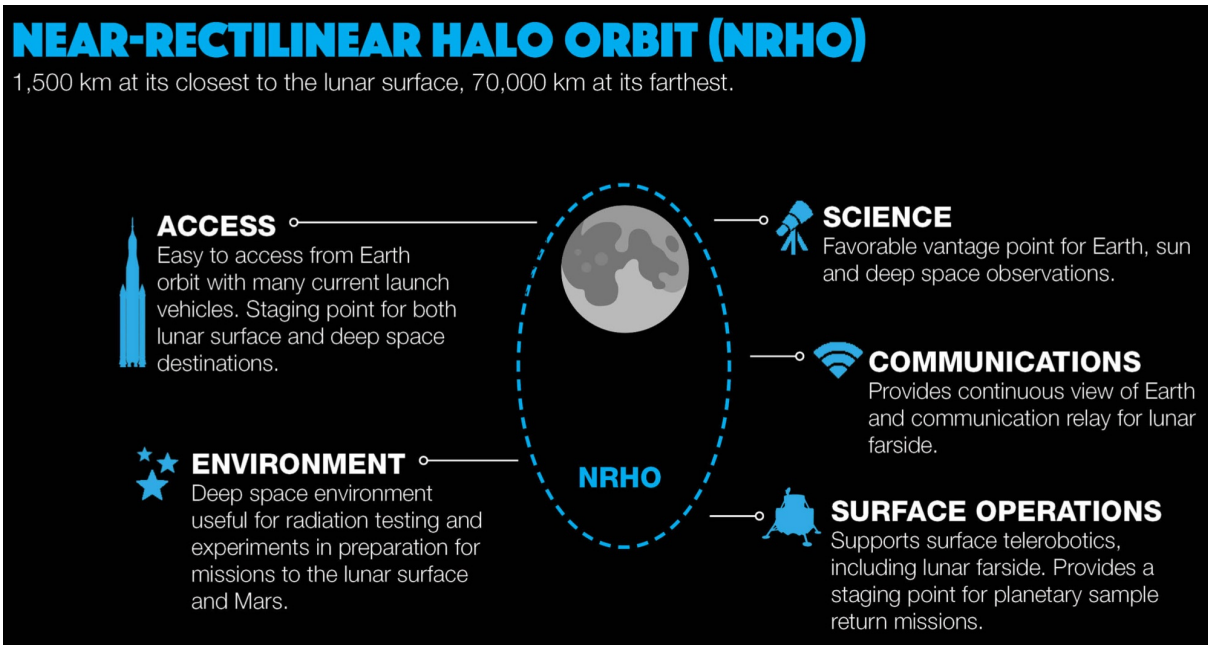
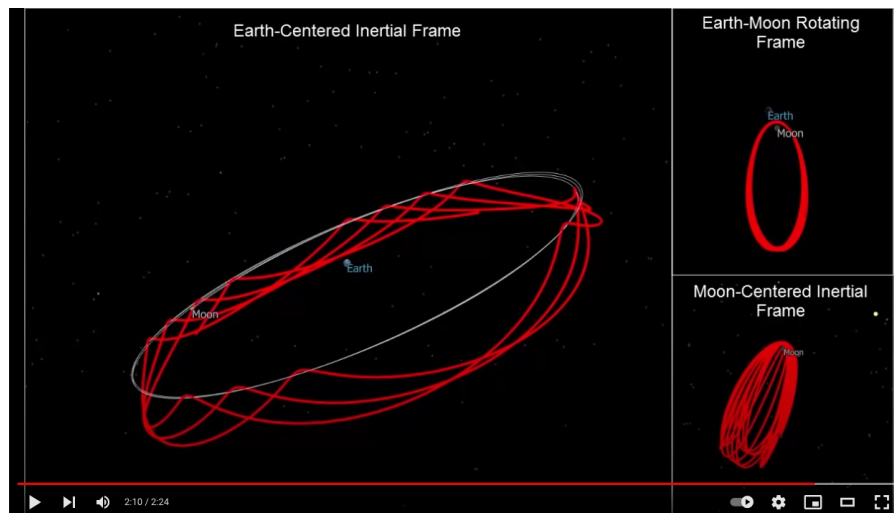


Image credit: NASA

The Near-Rectilinear Halo Orbit was chosen due to several benefits it provides:

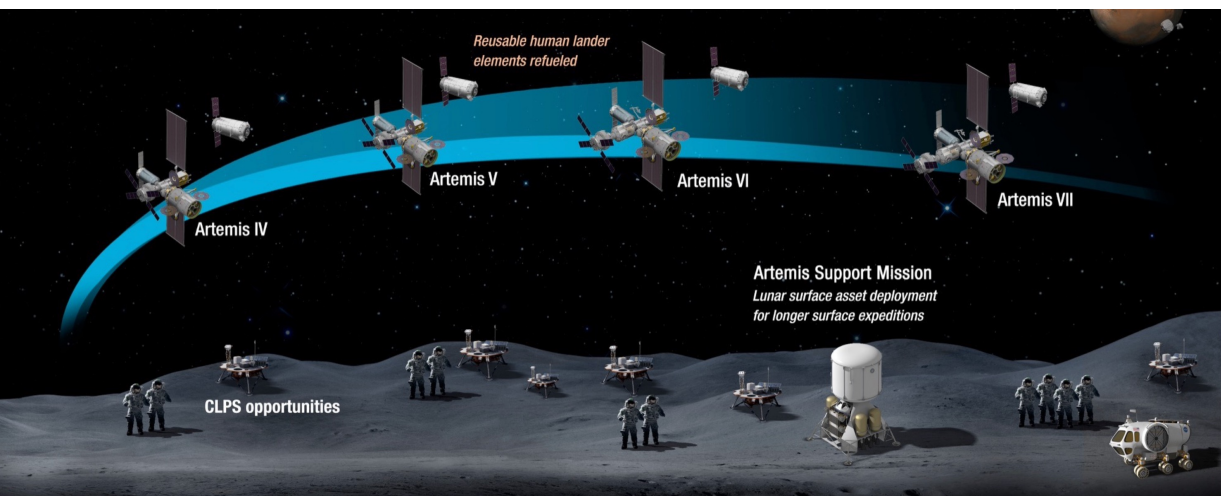
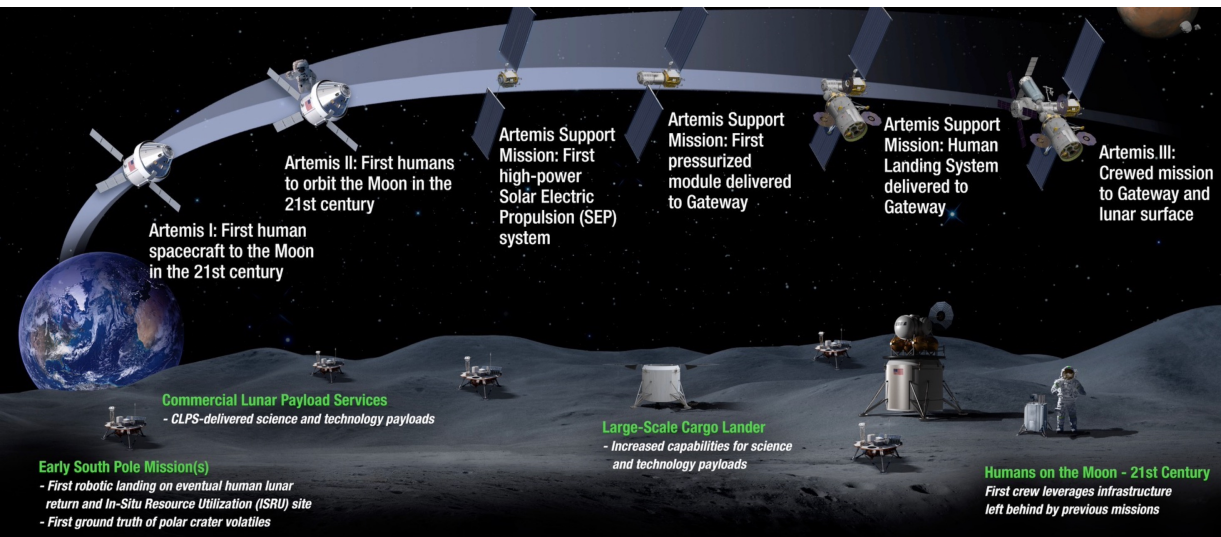
Relative stability of the orbit requires less fuel to maintain,
Readily accessible to visiting vehicles requiring orbital insertion,
Periodically near the lunar surface enabling fuel efficient landings,
Continuous line-of-sight to Earth and wide range of accessible lunar surface viewing,
Nearly continuous view of the Sun for monitoring space weather hazards.

The following video provides a visual depiction of the NRHO.



[Video Link](#) - Credit: NASA JSC

Mission Timeline



Artemis Phase I -- Lunar Surface

The overarching Artemis timeline is strategically envisioned in order to test components of the program in a risk-reducing sequence.

The first two elements of Gateway (PPE and HALO) will be put into orbit in the mid-2020s on the heels of the Artemis II mission, followed soon after with the addition of the I-HAB. Gateway will then enable the first crewed Artemis mission to venture to the lunar surface at the South Pole.

Artemis Phase II -- Mars Forward

Gateway will enable a sustained presence on the moon by helping to stage reusable infrastructure. Technology development and testing during this phase will transfer to capabilities needed for Mars missions. Planning for Gateway operations extends to 15 years after deployment (through the 2030s).

Gateway Utilization

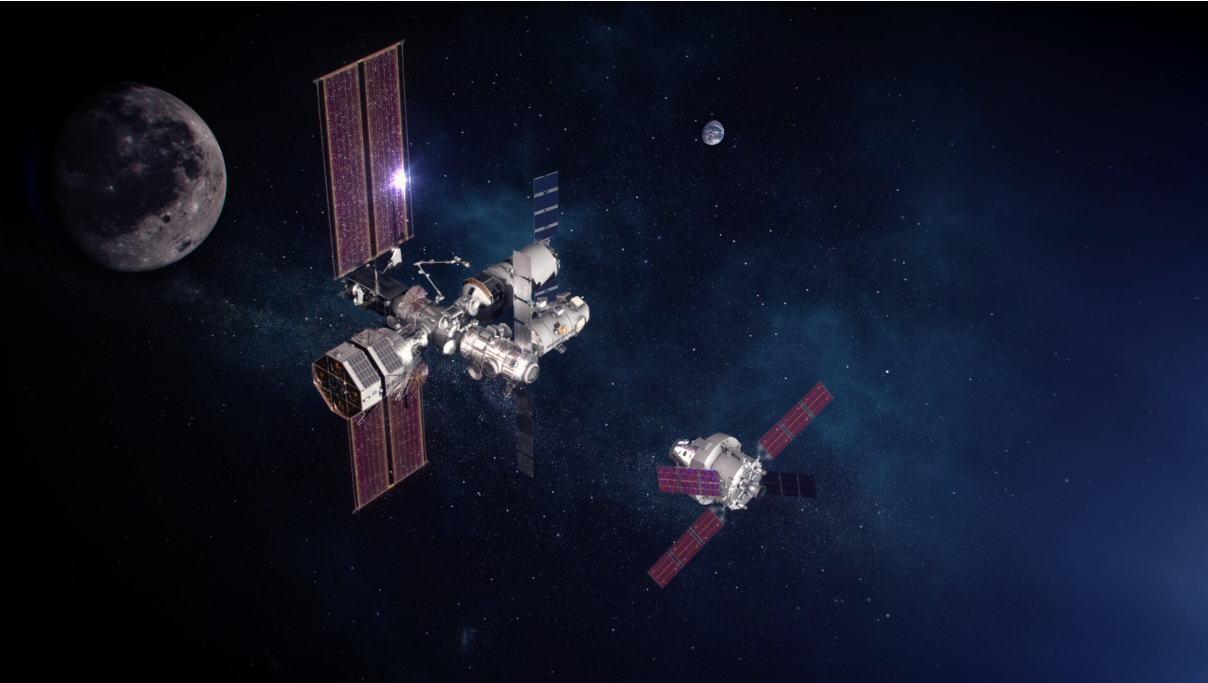


Image credit: NASA Johnson

Gateway's cislunar orbit provides an opportunity to make observations and measurements in the deep space environment as well as in a magnetically shielded environment, depending on the phase of the moon's orbit.

With this specialized location and available resources (e.g., power, environmental control, communications, and a structural platform), Gateway will be uniquely positioned for supporting a variety of discovery-space research activities -- spanning the Lunar, Heliophysics, Human Health, Space Biology & Life Sciences, Astrophysics & Fundamental Physics, and Technology & Materials disciplines.

Gateway has a number of ways *under consideration* for supporting small research payloads:

- External Small Orbital Replacement Unit Robotics Interfaces (SORIs)

- Internal facilities

- Visiting Logistics Modules (External and Internal capacity)

- Small satellite deployment

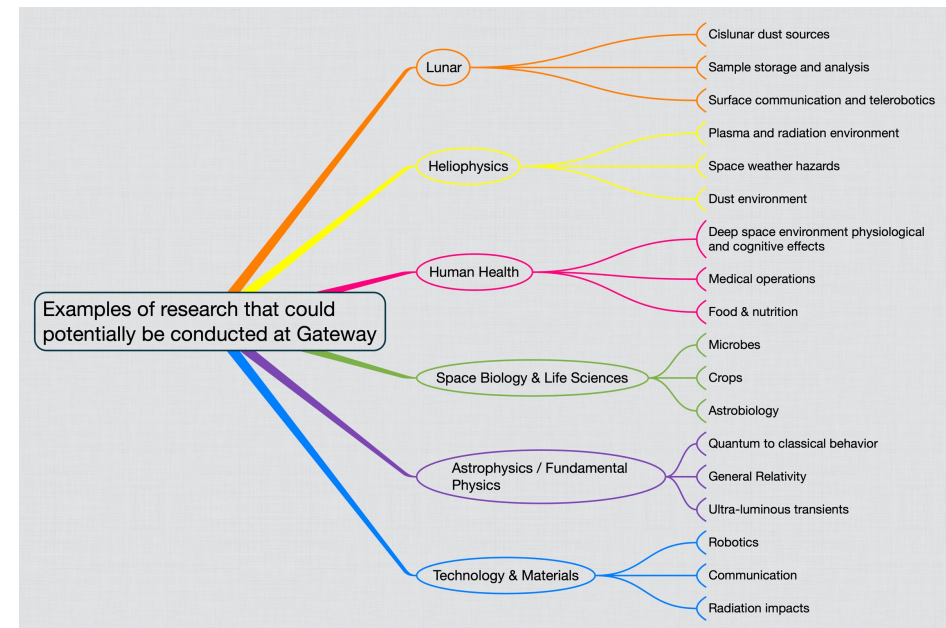
Science in Cislunar Space



Image credit: NASA Johnson

Due to limits on payload volume and mass that the Gateway architecture can support, the program is taking strategic steps forward to maximize science return against capability infrastructure investments. As the Gateway program is actively undergoing a 15-year science utilization and feasibility study, all research being considered through Gateway is motivated by the needs of the international partner communities.

Two external heliophysics payloads are included in the initial manifest, HERMES and ERSa, in order to begin characterizing the critical radiation and dust environments as that information has an immediate impact on all of the Artemis missions. A rotating suite of payloads on subsequent missions is being considered by partnering agencies to address unique discovery science, such as:



Numerous interests include cross-disciplinary science, particularly as the radiation and dust environments permeate these topics.

Key Takeaways



Image credit: NASA Johnson

The Artemis Gateway program is well underway to begin launching into cislunar space in the mid-2020s with operations extending through the 2030s. This orbiting lunar outpost, consisting of three permanent modules, will serve as a staging and support platform for lunar surface and Mars-forward activities.

Pathways are being developed to open opportunities for a variety of internationally-cooperative small research payloads, both internal and external to the Gateway, that take advantage of its unique orbital environment. Cross-disciplinary community involvement will be highly encouraged and anticipated.

The knowledge that we gain from these experiments operating within and outside of Earth's protective shield will drive our human space exploration technology and capabilities beyond their current limits that are bounded by Earth's gravitational pull.

[Link to "The Artemis Plan".](#)